

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>E053602-GL</b>	<b>FOR FURTHER ACTION</b>		see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. <b>PCT/IB 03/03332</b>	International filing date (day/month/year) <b>22/07/2003</b>	(Earliest) Priority Date (day/month/year)	
Applicant  <b>ISTITUTO CLINICO HUMANITAS</b>			

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 5 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☒ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2

☐ None of the figures.

BEST AVAILABLE COPY

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 03/03332

### Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

The present invention relates to a method and an apparatus for processing images of biological tissues, in particular of human or animal origin. The metric quantification of a biological body part or tissue or of an abnormal material spot or aggregate contained therein is also performed. The invention is applied in particular to the Computed Axial Tomography technique. In particular, the present invention comprises the following steps: 1a) dividing the image into boxes of different size iteratively; (2a) calculating for each quadrant at each division scale the relative dispersion (RD) obtained as the Standard Deviation divided by the mean value of the pixels, in order to associate to each quadrant a set of values of RD; (3a) generating a homogeneity map as a grey scale image, each point's brightness being given by the mean of the set of values of RD for each quadrant, wherein the image's regions having higher brightness correspond to homogeneous regions.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/03332

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 G06T5/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 G06T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>HATANAKA Y ET AL: "DEVELOPMENT OF AN AUTOMATED METHOD FOR DETECTING MAMMOGRAPHIC MASSES WITH A PARTIAL LOSS OF REGION"</p> <p>IEEE TRANSACTIONS ON MEDICAL IMAGING, IEEE INC. NEW YORK, US,          vol. 20, no. 12, December 2001 (2001-12),          pages 1209-1214, XP001101450          ISSN: 0278-0062          sect. II. B. 1) "average and standard deviation of pixel values"</p> <p style="text-align: center;">--- -/--</p>	1-19

☒ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

## ° Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the international search

24 February 2004

Date of mailing of the international search report

10/03/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Gao, M

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/03332

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JADWIGA ROGOWSKA: "Overview and fundamentals of medical image segmentation" HANDBOOK OF MEDICAL IMAGING PROCESSING AND ANALYSIS, 2000, XP002271325 Introduction in section 2 "thresholding" Sect. 2.1: "Global thresholding" -----	1-19
A	SAHOO P K ET AL: "SURVEY OF THRESHOLDING TECHNIQUES" COMPUTER VISION GRAPHICS AND IMAGE PROCESSING, ACADEMIC PRESS, DULUTH, MA, US, vol. 41, no. 2, 1 February 1988 (1988-02-01), pages 233-260, XP000000250 Sect. 3. A., par.4 -----	1-19

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.2

Claims searched incompletely: 1-19

Reason for the limitation of the search:

In claim 1 (and in the corresponding parts of the description), "the relative dispersion (RD) obtained as the standard deviation divided by the mean value of the pixels" is used as the homogeneity criterium.

This would mean that at a given division scale, in a given quadrant yielding a given value of standard deviation (i.e. a given measure of homogeneity), the mean value of the surrounding pixels in the considered quadrant would determine the homogeneity level of the quadrant: for a given value of standard deviation, a quadrant would be considered less homogeneous than another darker quadrant. Therefore, the RD value is not a proper measure of homogeneity.

Therefore, the definition of the homogeneity criterium (RD) is inconsistent with the property of the homogeneity map (generated accordingly to step 3a)) of displaying the homogeneous regions of the processed initial image.

In addition, in step 3a) of claim 1, it is not understood by the one skilled in the art why "regions having higher brightness correspond to homogeneous regions", since the smaller the standard deviation values are (yielding low brightness values), the more the corresponding regions are homogeneous.

Consequently, the search has been carried out considering:

- \* in step 2a), the standard deviation, not the RD, is calculated for each quadrant at each division scale

- \* in step 3a), for a given pixel, the homogeneity map brightness is given by the mean of the set of the standard deviation values of the quadrants at different division scale which the pixel belong to and after the rescaling of the standard deviation mean values in the range 0-255, relatively lower brightness regions correspond to relatively more homogeneous regions.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB 03/03332

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**